



PARASITES OF WESTERN AUSTRALIA

XIII

A NEW SPECIES OF DEMODICID MITE FROM THE MEIBOMIAN GLANDS OF THE BAT *MACROGLOSSUS MINIMUS*

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ABSTRACT

Demodex bicaudatus sp. nov. is described from the Meibomian glands of the blossom-visiting bat *Macroglossus minimus* Geoffrey, 1910. Holdfast adaptations to maintain the mites in the Meibomian gland against the secretion flow are compared with those of other species.

INTRODUCTION

Species of the genus *Demodex* Owen, elongate to worm-like mites, live in the pilo-sebaceous complex of mammals. Those inhabiting the Meibomian glands show special adaptations, mostly in immatures, against the secretion flow.

During the Western Australian Field Programme expedition to Mitchell Plateau, in the Kimberley Division of Western Australia in 1976-77, involving the Chicago Field Museum of Natural History and the Western Australian Museum, F.S.L. investigated the Meibomian glands of *Macroglossus minimus*. Contents of the glands were expressed by watchmakers' forceps and spread in Hoyer's medium. Some included small numbers of a new species of *Demodex* described below. All measurements are in microns.

SYSTEMATICS

Demodex bicaudatus sp. nov.

Figs 1-12

Holotype

WAM 80-311; male; from Meibomian glands of *Macroglossus minimus*, Camp Creek, near Aluminium Camp, Mitchell Plateau (14°50'S, 125°19'E); 19 October 1976. Host in Field Museum of Natural History, Chicago.

Allotype

WAM 80-315; female; host, locality and date as for holotype.

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Paratypes

WAM 80-312; egg and larva. WAM 80-313; egg, nymph. WAM 80-314; protonymph. Other paratypes are in the Field Museum of Natural History, Chicago; Department of Zoology, University of Massachusetts, Amhurst, and in the collections of the authors. Host, locality and date as in holotype.

Diagnosis

A medium-sized, broad species with the characteristics of the genus and narrow opisthosomal annulations. Largest adult, a female, 293 long overall. Opisthosoma relatively variable in length in all stages, occupying a third to a half of the body length. They are strikingly different from all known demodicids in that adults show an annulated dorsal, tail-like appendage on the opisthosoma, and developmental stages have a pronounced broadening of the podosoma.

Description

Male (holotype): Total length 196, width 65 and opisthosoma 57. Venter (Fig. 1): Legs evenly spaced on podosoma with coxal plates not touching in midline. Coxae I-IV with tooth-like elevations exteriorly and coxae II-III with cuticular excrescences midposterior. Femora (second movable segment) with rounded posteroventral spur. Genua-tarsi (third movable segment) fused with only 1 segmentation line ventrally. Claws straight, flattened from side to side, with 2 short apical and 3 longer midventral spines (Fig. 4). Genua-tarsi I-II with solenidion (*so*). Gnathosoma broader than long, with 2-segmented palp, oval pharyngeal bulb (pump) (*pb*) and subgnathosomal setae (*sg*); dorsally with 2 sclerotized cones identical with the larval egg teeth (possibly modified fixed digits of chelicerae) and conical supracoxal spines (*scx*). Opisthosoma with rounded terminus; opisthosomal organ absent. Dorsum (Fig. 2): Prodorsal shield with indistinct borders, 2 pairs of podosomal tubercles (*pt*) and 5 spots of irregular texture (these are probably muscle attachments). Opisthosoma with dorsal, tail-like appendage, unknown in any other demodicid and variable in shape and size (Fig. 3), other measurements are given in Table 1.

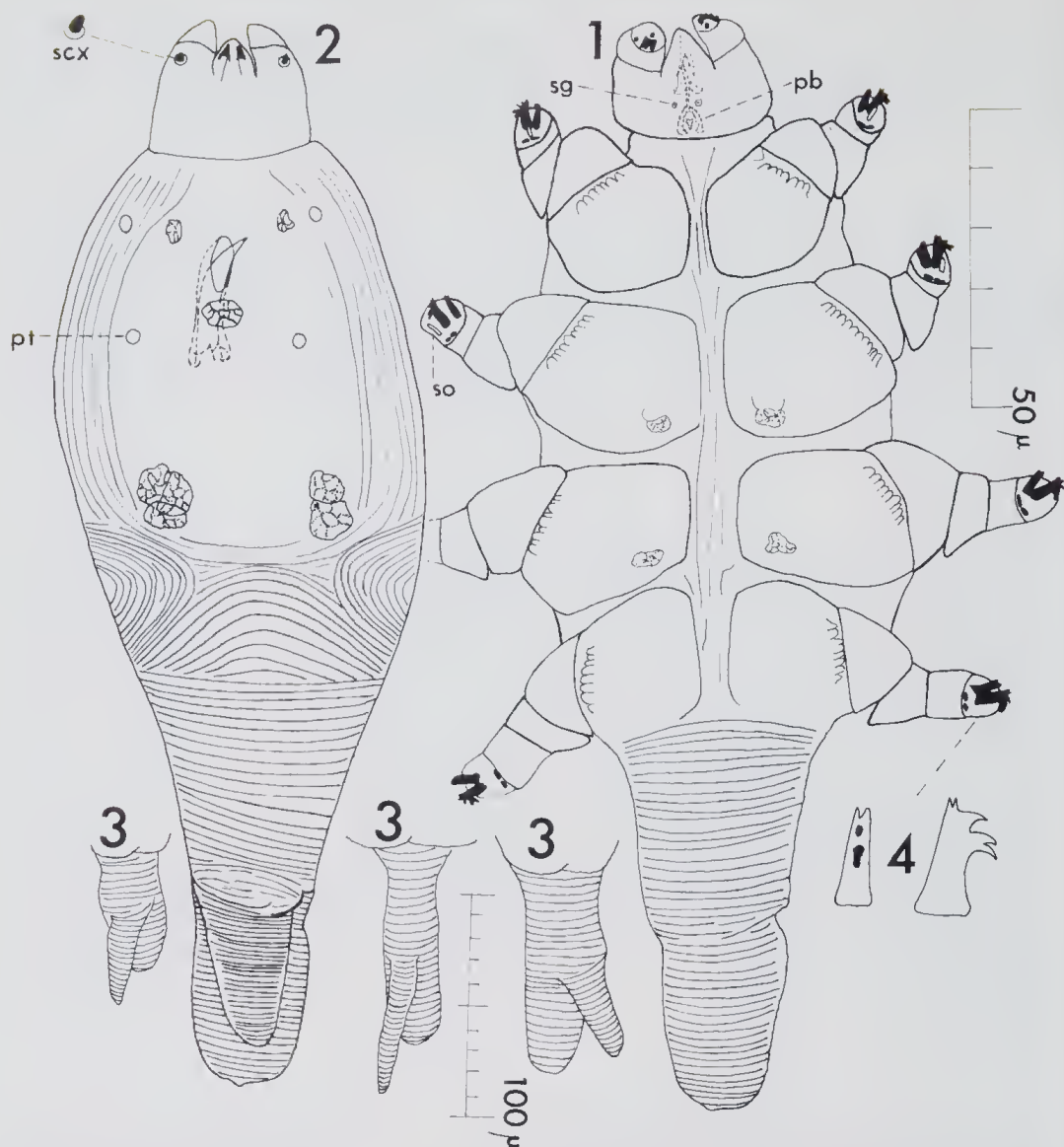
Female (allotype): Length 241, width 170 and opisthosoma 102. Venter (Fig. 5): Similar to that of male, genital opening (20) behind coxal fields IV, separated by several striations. Vulva protuberant. Cuticular pattern on coxal fields II-III different from male on the midposterior border of coxal fields. Dorsum (Fig. 6): Prodorsal shield weak, with 8 muscle attachments. Opisthosomal appendage somewhat smaller than in male, very variable in paratypes (Fig. 7). Podosomal tubercle not apparent.

Late Nymph (Fig. 12): Four pairs of unsegmented, bilobed, laterally inserted legs; leg IV with additional broad posterolateral lobe. Solenidia on legs I and II not observed. Greatest width at level of legs IV (between legs II and III in adults). Gnathosoma similar to that of adults; other characteristics similar to that of protonymph and larva.

TABLE 1

Meristic data (average and range) for stages of the life cycle of *Demodex bicaudatus* sp. nov. All measurements are in microns.

	N =	Male 8	Female 13	Nymph 3	Protonymph 5	Larva 1	Ovum 23
gnathosoma							
length \bar{X}		23	27	26	23	23	123
length range		20-29	26-32	24-29	20-26	—	119-127
width \bar{X}		28	30	32	22	20	59
width range		26-29	26-32	29-34	17-29	—	52-64
podosoma							
length \bar{X}		110	105	136	114	102	
length range		105-119	99-113	131-145	102-131	—	
width \bar{X}		66	69	94	61	67	
width range		61-70	58-81	84-110	44-75	—	
opisthosoma							
length \bar{X}		74	107	102	82	75	
length range		52-99	75-160	73-116	44-102	—	
width \bar{X}		29	54	34	30	29	
width range		26-35	44-61	23-44	20-46	—	
total body							
length \bar{X}		208	239	264	218	200	
length range		182-233	200-293	228-290	198-246	—	
penis/vulva							
length \bar{X}		27	21				
length range		23-30	17-25				
dorsal shield							
length \bar{X}		51	55				
length range		44-61	44-60				
width \bar{X}		41	48				
width range		41	44-58				
'second' tail							
length \bar{X}		41	32				
length range		26-61	23-58				
end podosoma/ begin 2 tail							
length \bar{X}		39	51				
length range		23-55	44-73				

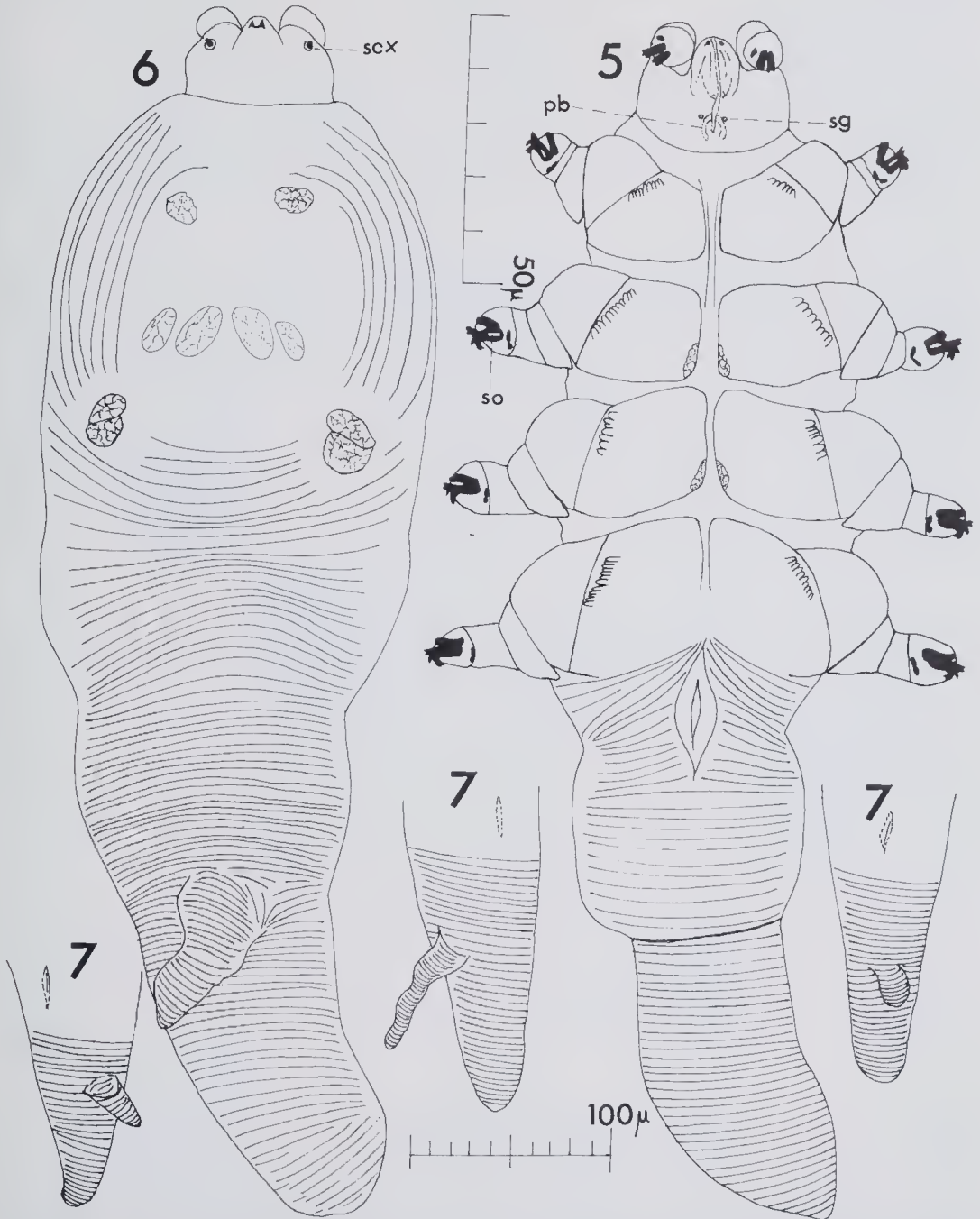


Figs 1-4: *Demodex bicaudatus* sp. nov., male: (1) holotype, venter; (2) holotype, dorsum; (3) opisthosoma dorsal view of paratypes; (4) claws in lateral and ventral view.

Protonymph (Fig. 11): Opisthosoma inserted dorsally, widest behind legs III. Legs and gnathosoma similar to that of larva.

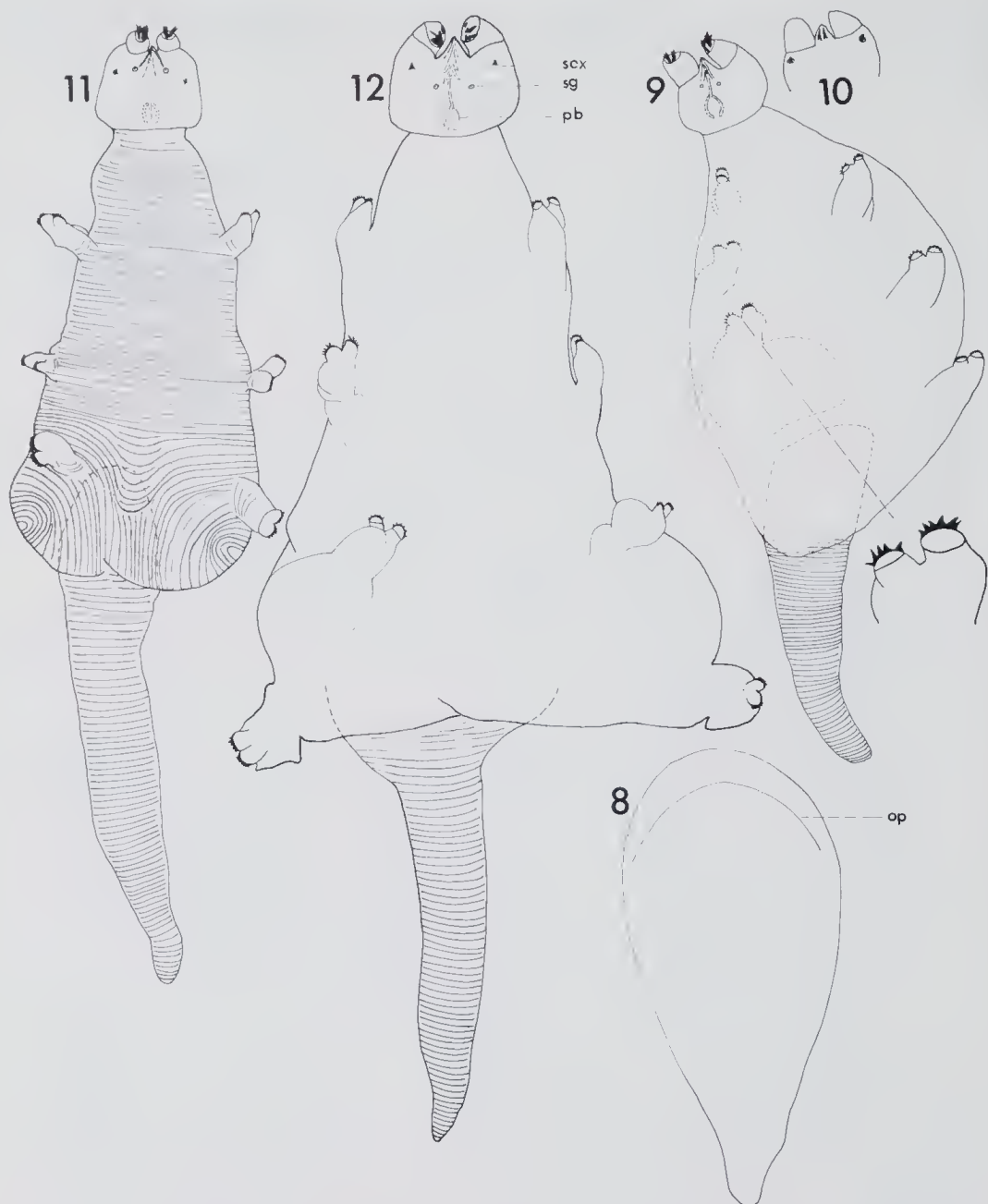
Larva (Fig. 9) (Pressed out of egg-shell during mounting): Three pairs of unsegmented, bilobed legs, each lobe carrying a broad spatulate 5-7-pointed claw. Solenidia on legs I and II not observed. Opisthosoma inserted postero-dorsally, widest at legs II. Gnathosoma similar to that of adults, but supra-coxal spines smaller and single-tined spine on palpal tarsus not observed.

Egg teeth longer than in nymphs and adults. Ventral scutes absent; no appendage dorsally on opisthosoma. Annulation distinct only on opisthosoma.



Figs 5-7: *Demodex bicaudatus* sp. nov., female: (5) allotype, venter; (6) allotype, dorsum; (7) opisthosoma dorsal view of paratypes.

DEMODICID MITE FROM *MACROGLOSSUS MINIMUS*



Figs 8-12: *Demodex bicaudatus* sp. nov., developing stages: (8) egg; (9) larva, laterally; (10) gnathosoma larva, dorsally; (11) protonymph, venter; (12) nymph, venter.

Ovum (Fig. 8): Pear-like, bulbous anterior. Length less variable than in other stages. Operculate groove distinct. Oriented in glands with posterior end towards aperture.

DISCUSSION

Species of *Demodex* living in the narrow ducts of the sebaceous glands of hair follicles are adapted to the habitat and the flow of secretions not only by the worm-like shape of the adults, but also by holdfast mechanisms in the developmental stages, especially during the non-active moulting periods. Larvae and nymphs have short, one or two-segmented legs and posteriorly directed ventral scutes serving to anchor the mites in the wall of the duct. Species living in the Meibomian glands with greater secretion flow and wider duct diameter have developed further adaptations in the eggs and developmental stages.

The family Demodicidae, highly adapted to parasitic life in all stages in very small niches, have not replaced oviparity (the egg is the most sensitive stage to loss by secretion flow) by viviparity as did other endo- and ectoparasitic mites, e.g. Spinturnicidae, Rhinonyssidae, Dermanyssidae, Erey-netidae, Teinocoptidae, Laminosioptidae and Chirodiscidae. Particularly, elimination of eggs is prevented by their shape, e.g. the Y-shaped eggs in *D. gapperi* (Nutting *et al.*, 1968) and *D. molossi* (Desch *et al.*, 1972), and the bulbous eggs with a spine-like or narrow posterior end in *D. melanopteri* Lukoschus *et al.*, 1972 and *D. lacrimalis* Lukoschus and Jongman, 1974. Operculate eggs and larval egg teeth enable rapid emergence of larvae (*D. melanopteri*).

In larvae and nymphs of *D. molossi* and *D. longissimus* (Desch *et al.*, 1972), the unusual, elongated leg III and dorsal, propodosomal 'wings' (*D. molossi* only) anchor these species in wide ducts, while elongate, laterally directed palps and long, unsegmented legs with broad, spatulate, multiple-tined claws give reaction in the narrow ducts inhabited by *D. lacrimalis* and *D. melanopteri*. In what is believed to be the most primitive species of *Demodex* known, *D. marsupiali* (Nutting *et al.*, 1980), elongate supracoxal spines serve this purpose.

Demodex bicaudatus, living in wide Meibomian ducts, shows operculate bulbous eggs, egg teeth (possible fixed digits of chelicerae, present in all stages, see Figs 2 and 10), large segmented legs with multiple-tined claws, and exceptional broadening of the podosoma in the developmental stages. The posterodorsally inserted and dorsally arched opisthosoma is an additional anchoring mechanism in very wide ducts, as is the unusual dorsal opisthosomal appendage in adults, seemingly a second tail which probably acts as a holdfast barb.

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